Title: To Soup from Garden

Brief Overview:

This unit involves parts of a whole and equivalent fractions. Students will construct meaning of fractions through various activities and games. They will organize a vegetable garden. As a culminating activity, they will change a vegetable soup recipe to serve a larger or smaller amount of people and will actually make the soup.

Links to NCTM Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers and which are solved in a cooperative atmosphere.

- **Mathematics as Communication**
  Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Mathematics as Reasoning**
  Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Mathematical Connections**
  Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.

- **Number Sense and Numeration**
  Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials.

- **Geometry and Spatial Sense**
  Students will demonstrate their ability to apply geometric relationships using one and two dimensional objects. They will demonstrate congruency, similarity, symmetry, and reflection and apply these concepts to the solution of geometric problems.

- **Measurement**
  Students will demonstrate and apply concepts of measurement using standard customary units. They will apply measurement to real-world problem-solving situations.

- **Statistics**
  Students will demonstrate their ability to collect, organize, and display data and will interpret information obtained from displays.

- **Fractions and Decimals**
  Students will demonstrate their ability to solve problems using arithmetic operations with fractions.

Grade/Level:

Grades 3-5

Duration/Length:

7 class days (variable)

Prerequisite Knowledge:

Students should have a basic understanding of multiplication and division.

Objectives:

Students will:

- demonstrate an understanding of the fractional parts of wholes and equivalent fractions.
- explain their reasoning.
- create a garden using specific fractional parts.
- participate in a survey to collect data, complete a tally chart, and a bar graph.
- participate in a game using fractional parts and equivalent fractions.
- change a recipe to a larger or smaller amount.
- work in a cooperative group.
- follow a recipe to make soup.

Materials/Resources:

- Give Me Half by Stewart Murphy or similar literature involving fractions.
- Hershey Bars, two-color plate manipulative, geoboards and geoboard paper, pattern blocks, fraction circles or bars
- Game - Choice of sets of vegetables (cut-outs, real or plastic models, or pictures)
- Paper for bar graphs
- Tagboard or large paper for posters
- Teacher/Student Resource Sheets
- Rulers, crayons, scissors
- Soup ingredients (see recipe)
- Measuring tools, cooking utensils
- Hot plate, stove, or crock pot
- Soup Pot
- Serving bowls, spoons, napkins

Development/Procedures:

Day 1:

- Read literature selection and conduct a class discussion to introduce fractions.
- Complete a web assessing their background knowledge of various ways to write one half or concepts associated with one half. See Teacher Resource 1 for examples or suggested ideas.
- Exploration of fractional parts of a whole using Hershey Bars, Rice Krispie Treats, etc. You may also want to investigate parts of a set with Smarties, M&M's, cereals, etc. Be sure to include the modeling of one half, one fourth, and one eighth.
- Allow students time to reflect on the first page in the journal (Student Resource 1) about the day's activity.

Day 2:

- Review previous day's concepts using available manipulatives. You may want to use two-color plates (see Teacher Resource 1 for directions), pattern blocks, tangrams, more food, etc.
- Using overhead geoboard, model at least two different ways to show one half of the geoboard. Be sure to stress that area of the two parts is equal by counting blocks not pegs. Students will then model other ways to make one half on individual geoboards and record their results on geoboard paper. You may also want to do this in pairs. Share results giving a justification for their answers.
- Extend concept development with irregular shapes (see Teacher Resource 1 for examples) depending on the level of the children.
- Assess student's understanding with Student Resource 2.

Day 3:

- Review previous concepts with "The Veggie Game" (see Teacher Resource 1).
- Continue modeling fractions in different ways with various manipulatives such as pattern blocks using one fourth and one eighth. Incorporate the term "equivalent fractions". Be sure to record student responses using equal signs in a series.
- Allow students time to reflect on the day's activities in their journal (Student Resource 1).

Days 4 and 5:

- Conduct class discussion on gardens. You may want to include the purpose of gardens, steps to make a garden, different types of gardens, and how the harvest is used. Integration with Science would be possible at this time by planting a seed and conducting a plant unit.

- Complete Favorite Vegetable Survey (Student Resource 3). Record class results on overhead or board to be copied by individual students.
- Introduce Performance Assessment Task with Vignette (Student Resource 4).
- Complete (Activity 1 and 2).

Days 6 and 7:

- Conduct a class discussion about student's knowledge of recipes. Be sure to include concept of doubling, tripling, and cutting recipes in half. Journal Day 6 may be used to reflect their thoughts.
- Complete recipe activity (Activity 3). This could be done individually, in pairs, or in cooperative groups. Complete Activity 4.
- Make soup (Activity 5). Allow students to measure, prepare ingredients and enjoy their results.
- Complete poster (Activity 6).

Performance Assessment:

Students can be evaluated based on the following:

- Student Resource 1 - Journal entries (See rubric - Teacher Resource 2).
- Student Resource 2 - Use journal rubric (Teacher Resource 2).
- Student Resource 3- (See rubric - Teacher Resource 3).
- Student Resource 4 - (See Teacher Resource 4).

Extension/Follow Up:

- Double, triple, etc. other recipes.
- Integration with Science Unit on plants.
- Display of student gardens from Student Resource 4 on a bulletin board. Fractions could be labeled.
- Research projects on gardens/vegetables.
- Actual construction of a class garden on school property, including area and perimeter.
- Field trip to Soup Kitchen.
- Volunteer work at a Soup Kitchen. Calculate volunteer hours.

Authors:

Carol Gabbard
Westside Intermediate
Wicomico County, MD

Karen Horner
Westover Elementary
Somerset County, MD

TEACHER RESOURCE 1

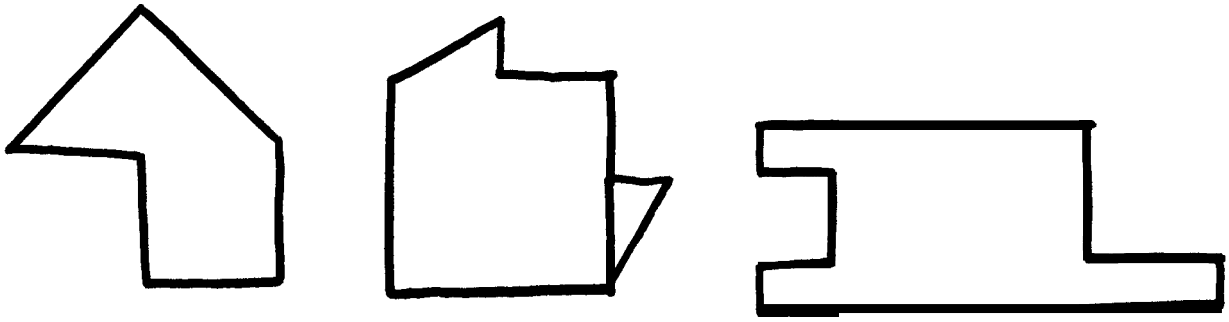
Sample **Web Answers:**

30 minutes, half gallon, half pint, 1÷2, any equivalent fraction, $.50, 1:2, 50%, .5, ½, ½ year, ½ yard (18 inches), any picture, number line.

Two-color plate directions:

Take any two color hard plastic plates (Solo) and cut a slit along any radius (from center point to outer edge) on both plates. Slide the slit of one plate into the slit of the other plate. Rotate by holding the outer edge of one of the plates.

Examples of Irregular Shapes:



Directions for Veggie Game:

The object of the game is for teams to describe the fractional part of another team for a given fraction. Each student will represent one vegetable. * Example: Team 1 - One student with a tomato, 2 students with carrots, 1 student with green bean, 1 student with broccoli. Teacher calls 2/5 and allows teams time to discuss possible answers. The answers may be written or presented orally. Teams take turns giving their answers and earn a point for each correct answer. The first team could answer 2 carrots out of 5 vegetables. Another team answers two green vegetables out of 5 vegetables and so forth. To end that round, either teacher or another team decides there are no more choices. Another team will then become the set of vegetables.

Teams should have at least 5 students. There should be a variety of vegetables on each team if possible to allow for multiple answers for the given fraction.

* If cut-out vegetables are desired, they can be made on large paper or tag board. They could be used as vegetable masks with cut-outs for eyes or the whole face can be cut out.

TEACHER RESOURCE 2

Scoring Rubric for Journal

Score Point 3

- Mathematical explanation is completely stated in a clear manner using the appropriate math vocabulary.
- Complete sentences are always evident.

Score Point 2

- Mathematical explanation is sometimes stated in a clear manner which may or may not use appropriate math vocabulary.
- Complete sentences are sometimes evident.

Score Point 1

- Mathematical explanation is rarely stated in a clear manner which may or may not use appropriate math vocabulary.
- Complete sentences are rarely evident.

Score Point 0

- Mathematical explanation is off task or missing.

TEACHER RESOURCE 3

Scoring Rubric for a Bar Graph

Score Point 4

All of the following evident:

- Accurate display of the bars
- Title and correct labels for both axes
- Scale has data displayed at equal intervals, bars are labeled, and appropriate pattern chosen for the scale

Score Point 3

- Accurate display of most of the bars
- Title and correct label for both axes
- At least two of the following are evident:
  - Scale has data displayed at equal intervals
  - Bars are labeled correctly
  - Appropriate pattern used

Score Point 2

- Accurate display of most of the bars
- Title and one or both axes correctly labeled
- At least one of the following is evident:
  - See score point 3

Score Point 1

- Accurate display of some of the bars
- Title and both axes may or may not be labeled
- At least one of the following is evident:
  - See score point 3

Score Point 0

- Little or no data displayed accurately

TEACHER RESOURCE 4

Scoring for Task "To Soup From Garden"

Activity One:

2 - Correctly organized - ½ tomatoes, 1/4 corn, 1/8 carrots, 1/8 green beans
1 - Not correctly organized
0 - Blank

Activity Two:

Use Journal Rubric - Teacher Resource Two

Activity Three:

3 - All ingredients correctly doubled - 2 lbs. beef cubes, 3 onions, ½ tsp. oil, 14 potatoes, 9 lbs. tomatoes, 5 ½ cups corn, 7 1/3 cups carrots, 3 ½ cups beans
2 - Most ingredients correctly doubled
1 - Few ingredients correctly doubled
0 - No ingredients correctly doubled

Activity Four:

Use Journal Rubric - Teacher Resource Two

Activity Five:

Not scored

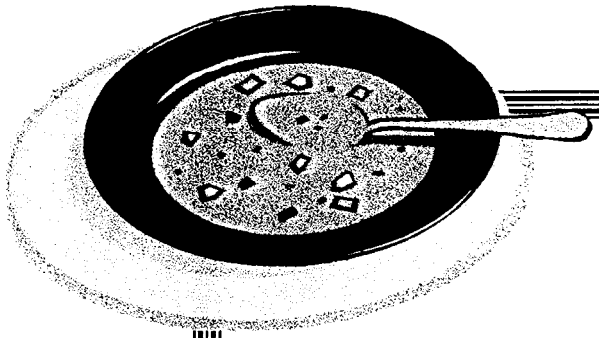
Activity Six:

3 - Poster with clearly stated directions, in logical sequence using math vocabulary,
- Includes 3 examples with appropriate labels
- Organized and attractive

2 - Poster with most directions clearly stated, in logical sequence using math vocabulary
- Includes at least 2 examples with appropriate labels
- Mostly organized and attractive

1 - Poster with some directions clearly stated, may or may not be in logical sequence, may or may not have appropriate math vocabulary
- Includes at least 1 example with or without appropriate labels
- Rarely organized and attractive

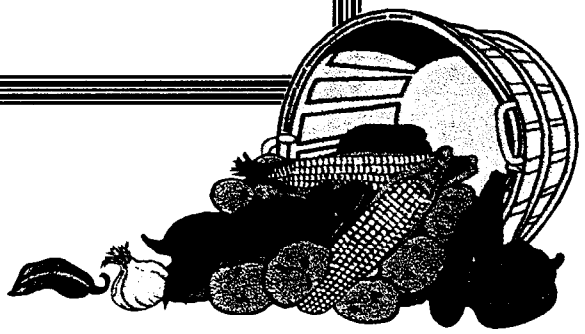
0 - Poster off task, incomplete



TO SOUP

FROM GARDEN

JOURNAL



Day 1

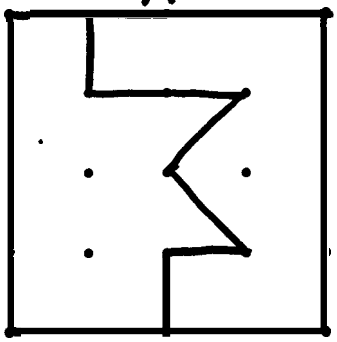
Day 3

Day 6

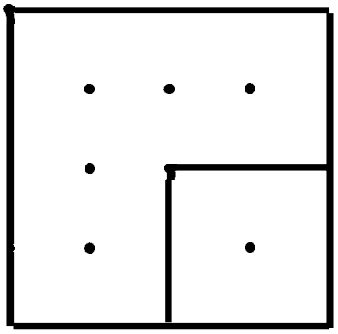
STUDENT RESOURCE 2

Directions: Which of the following figures represents ½ of the geoboard? Justify your answer. You may wish to use information from your journal.

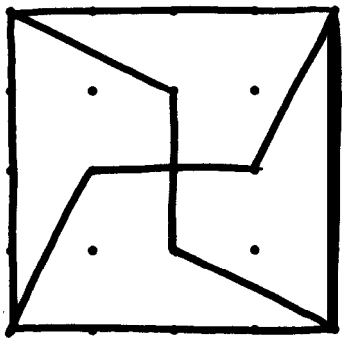
A



B



C



STUDENT RESOURCE 3

FAVORITE VEGETABLE SURVEY

Vegetables are not usually everyone's favorite food, but everyone usually has at least one favorite! What is your favorite vegetable? Write your choice on the line.

_____

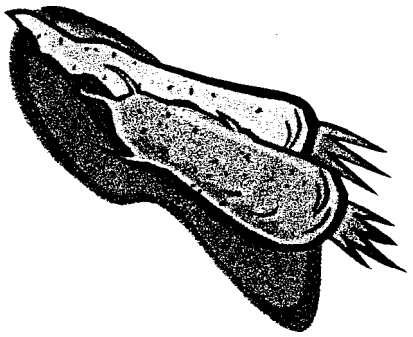
What do you predict would be the favorite vegetable of our class?

_____

In order to test our prediction, we will gather data from the students in our class. Record the results on the table below.

_____

Use this data collected from the class survey to make a bar graph. These graphs will be displayed in the cafeteria during School Lunch Week to promote eating your vegetables. Construct your bar graph on the paper provided by your teacher.

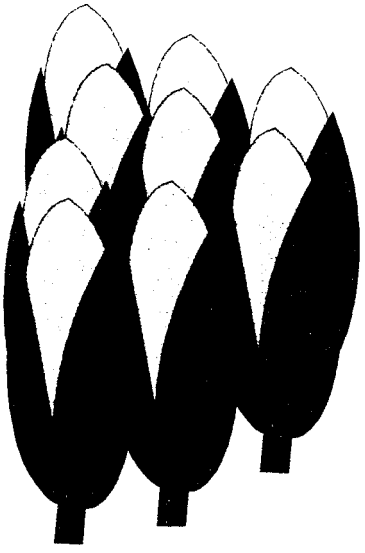


STUDENT RESOURCE 4

To Soup From Garden

Our class has been selected to participate in a volunteer program at the local Soup Kitchen. Volunteers have to provide a pot of Vegetable Soup for at least one meal. To prepare for this day, we need to grow the vegetables and actually make the soup from our harvest.

In this task, you will be asked to arrange a garden according to specific directions, change a recipe, and actually make the soup to prepare for this special day. The Kindergarten teacher has heard of our plans and has asked us to help her class make a recipe larger using our knowledge of fractions. You will make a poster to help you instruct these students.

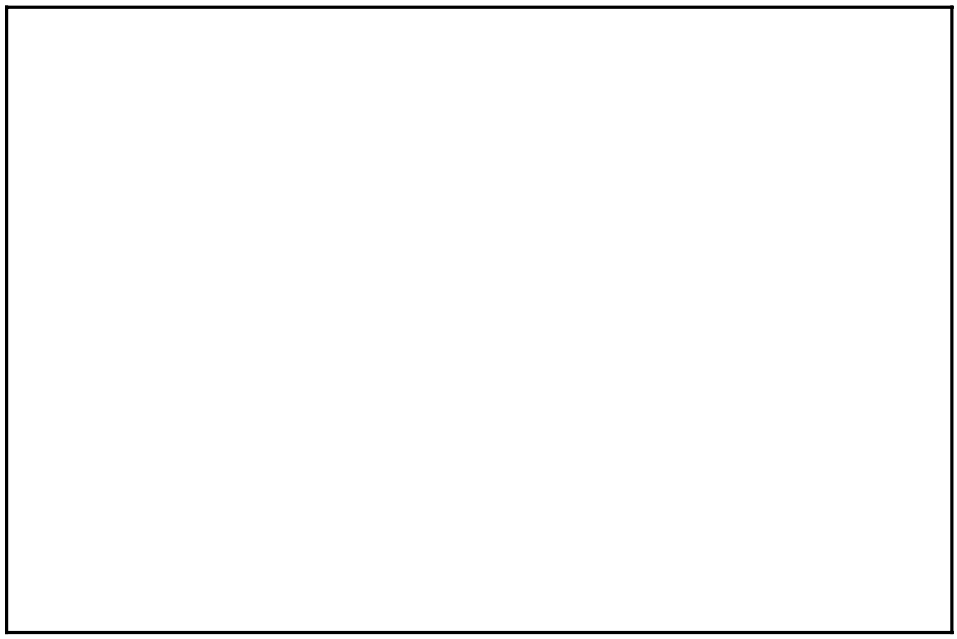


Activity One:

In order to grow the vegetables, the garden has to be organized. We have to grow tomatoes, green beans, corn, and carrots. An expert in growing vegetables has informed us that our garden should be divided into the following sections:

One-half tomatoes
One-fourth corn
One-eighth green beans
One-eighth carrots

Use your geoboard to organize your garden to display the information above. Then draw your garden on the plot below.



Key:

Activity Two:

Choose one vegetable section displayed in your garden plot. Explain how the vegetable you have chosen is the correct fractional part of the garden.

_____

_____

_____

_____

_____

_____

Activity Three:

The recipe we will be using is too small to feed a large number of people. We need to double the recipe. On the line next to each ingredient, write the correct amount to be used in a double batch.

Vegetable Soup

1 lb. beef cubes _____
1 ½ onions _____
1/4 tsp. oil _____
7 potatoes _____
4 ½ lbs. tomatoes _____
2 3/4 cups corn _____
3 2/3 cups carrots _____
1 6/8 cups beans _____

Activity Four:

Choose one ingredient that contains a fractional part. List the steps you took to double it.

_____

_____

_____

Activity Five:

Before the big day, our teacher decided that we need to make a practice batch. Follow the recipe to make the soup.

Activity Six:

The Kindergarten teacher just finished reading Stone Soup to her class. The students in her class wanted to make soup after smelling our delicious soup. The recipe in the book was too small to feed the entire class. The Kindergarten asked our class to teach the students how to make a recipe bigger. In order to help you teach the lesson, you will design a poster showing how you can double a recipe using your knowledge of fractions. Your poster should contain step by step directions how to double an ingredient. You will probably want to include at least 3 examples. Remember to include the necessary labels. The poster should be organized and attractive to keep the attention of the Kindergarten children. Construct an appropriate graphic organizer below for your steps. Design the rough draft of your poster on a piece of scrap paper before doing your final copy.